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M. W. Boyer, General Manager — June 16, 1953

John C. Bugher, M.D., Director, Division of Biology and Medicine

MONTHLY STATUS AND PROGRESS REPORT, MAY 1953 - DIVISION OF BIOLOGY AND MEDICINE

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SURNAME ▶	O'Neill	Brown	Dr. Bugher			
DATE ▶	6/16/53	6/16/53	6/16/53			

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MONTHLY STATUS AND PROGRESS REPORT

Division of Biology and Medicine

MONTH OF MAY, 1953

(272)

Research Activities

Effects of X-Rays on Frog Retina. (UNCLASSIFIED) The University of California Radiation Laboratory at Berkeley has completed a study on the effect of X-rays on animal retina. Particularly the visual responce to small doses of X-rays was examined. Measurements were made for the threshold intensity of the bull frog needed to elicit a light stimulus and the adaptation and recovery after small doses of X-rays. It was found that electrical response could be measured on the retina after 0.6 roentgens, that during exposure to X-rays the sensitivity to light was reduced, and that recovery of the retina after an X-ray stimulus was slower than after a light stimulus. This recovery phenomenon indicates that the effect is to a large extent reversible and the phenomenon is one of the smallest reversible responses observed today with penetrating radiations.

Biological Synthesis-Fatty Acids. (UNCLASSIFIED) Research at the University of California at Los Angeles includes a project on the mechanism of metabolism in animals with respect to fatty acids in the body. It has been demonstrated for the first time that an "essential" fatty acid can be synthesized in the animal body. This "essential" acid—arachidonic—contains twenty carbon atoms. Synthesis was accomplished from carboxyl labeled acetate and a compound containing eighteen carbon atoms. Further studies will be undertaken to elucidate the physiological significance of this reaction.

Biological Effects of Radiation. (UNCLASSIFIED) At Los Alamos Scientific Laboratory, experiments have been undertaken to determine the biological effects of total-body X radiation in mice. Pretreatment of mice with p-aminopropiophenone (an agent producing a pronounced hypoxia) or gluthathione exerted a marked protective effect against total-body X radiation. A negligible degree of protection was found when mice so pretreated were exposed to thermal column radiation (thermal neutrons plus gamma contaminant).

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It is tentatively suggested that the lack of effect of these agents against thermal column exposure results from the fact that the majority of the ionizations are produced along a short track and that under these conditions certain products produced by the ionization of water can be formed independently of molecular oxygen.

On the basis of the data reported it appears that agents which are protective against one type of ionizing radiation may not be of value against all types and that tissue oxygen tension may play a role in producing the marked differences observed in the relative effectiveness of neutrons and X-rays in various tissues.

Radiation Effects on Mortality. (UNCLASSIFIED) The effects of whole body irradiation of male rats on mortality among their offspring is being studied by the AEC-University of Tennessee research group. Male rats were exposed to 300 roentgens of gamma rays from a Cobalt 60 source, or to X-rays from 250 KVP. The irradiated males were subsequently mated to virgin females. The pregnant females were sacrificed, and it was found that the foetal death rate showed an increase in comparison with non-irradiated controls. The per cents of deaths for the various groups were:

Control group..... 6.46 per cent
Gamma-ray exposure... 19.37 per cent
X-rays (250 KVP)..... 19.92 per cent

After 60 days the same male animals were used in repeating the experiment. The values obtained after sacrifice of the second group of pregnant females were 7.39 per cent for gamma exposure and 8.19 per cent for X-rays. This does indicate a period of recovery and may be due to dominant lethal mutations induced during exposure in the more mature testis cells.

Research in Photosynthesis. (UNCLASSIFIED) At Oak Ridge National Laboratory, recent information has been reported in connection with the activity of light energy in photosynthesis. It has been known for some time that green plants fluoresce and that the fluorescence is the back reaction from excited chlorophyll which has absorbed light. When the lights are turned off of a plant, the fluorescence ceases in less than 10^{-7} seconds and is felt to represent the reversibility of the first step in light absorption by chlorophyll, namely, the formation of excited chlorophyll. Investigations have shown that there is also a much weaker light emission from the dark plant which lasts for some seconds after the plant is placed in the dark. The emission spectrum of this delayed weak light has been shown to be the same as the

fluorescence of chlorophyll. The data indicate that the delayed light emission represents the reversal of the first several steps in photosynthesis, the light ultimately coming only from the reversal of the first step.

Industrial Health

Radiation Instruments Program

1. Special Electronics Development Program. (UNCLASSIFIED) The Steering Committee for the Electronics Development Program held a meeting at Argonne National Laboratory on May 14, 15, 1953. In the light of technical developments and the increasing demand for special electronic requirements of various AEC installations, recommendations were made to accelerate studies in (a) basic research on the phenomena of photoelectric emission; (b) research development of new photoelectric and secondary emissive surfaces; (c) improvement of photomultiplier transit spread characteristics; (d) development of large photo-cathode multiplier tubes up to 30" and 36" in diameter; and (e) modal shop fabrication of test quantities of tubes developed under the program. Research projects will be undertaken with Notre Dame University, the Radio Corporation of America, and the Allen B. DuMont Laboratories.

2. Review of Standardization Problems. (UNCLASSIFIED) The accelerated pace of instrument development in the atomic energy field inevitably introduces a number of problems in standardization requirements. The Radiation Instruments Branch maintains close liaison with the many organizations of government and private industry and serves as representative or advisory member on numerous committees which formulate recommendations to further standardization of basic instrumentation and component parts pertinent to technical operations.

Highlights of some of the problems recently considered and action taken are given:

a. In the nuclear instrumentation field, one of the major problems lies in the production of various types of electrical cable connectors on manufacturers' equipment which serve similar functions. At a recent meeting of the Radio-Television Manufacturers Association Sub-Committee on Nuclear Instrumentation, the frequency of use of various connector-type cables in AEC laboratory-built nuclear measurement equipment was discussed. A tabulation was given which showed that two particular types of connectors (identified as the IPC 27000 and IPC type HN series) were

in predominant use for high voltage service, and for low voltage circuits the IPC 4500 was used. The introduction of this problem led to the recommendation by the Sub-Committee that the standard type of high voltage connector on commercial nuclear measurement equipment would be of one type, namely type-HN series connector. The type UHF (IPC 11875) connector with teflon insert was selected as the standard type for use in low voltage circuits. Although such problem areas may not appear significant, the recommendation represents a step forward. The efficacy of technical operations is dependent on the flexibility of interconnecting equipment, and standardization procedures are important in reducing costs and labor.

b. In an effort to prepare the way for future developments in this field, meetings are held periodically with the Office of Basic Instrumentation of the National Bureau of Standards to coordinate plans for research studies. Membership is made up of the sponsoring agencies such as AEC and the Department of Defense who are principal consumers of special instruments and devices necessary in technical operations. This program is designed to establish a cohesiveness of purpose and effort in basic instrumentation research projects at the various laboratories of interested groups, and to eliminate unnecessary duplications of effort. This work is of benefit to all fields of science in which problems of instrumentation are related. Recommendations for the coming year were made to emphasize studies on critical surveys of currently used instruments, or instrumentation techniques; theoretical or experimental evaluation of new applications of physical principles in measurement and control; and theoretical analysis in various fields of measurement control and handling of data.

General

Fall-out Phenomena--Washington, D.C. ([redacted] Following the atomic detonation of May 25 at Nevada, the trajectory of the path of the atomic cloud for the 18,000-foot level showed that it passed over Washington, D.C. on May 26. On the same day, a hailshower occurred in the Northwest section of the city which produced hailstones, some of which were two to three inches in diameter. The radioactivity in the air at the time of the hailshower recorded at the Naval Research Laboratory was the highest yet noted here, i.e., 6×10^{-3} microcuries per cubic meter averaged over 24 hours, with the activity remaining in the air in significant amounts for about five hours. The maximum permissible concentration is 1.0 microcuries per cubic meter averaged over 24 hours.

The hailstones were collected and melted down to examine the water for radioactivity. The activity measured on the third day after detonation by the Naval Research Laboratory was 2×10^{-4} microcuries per cubic centimeter, and by the Division of Biology and Medicine, 3.2×10^{-5} and 1.6×10^{-5} microcuries per cubic centimeter. These may be compared to the maximum permissible concentration of 5×10^{-3} microcuries per cubic centimeter for drinking water, which is based on the assumptions that all of the water intake will be from the same source and consumed at this concentration continuously. Of course, the activity for the hailstones quoted above will decay rapidly according to well-established principles.

Data have also been obtained by the Naval Research Laboratory showing that activity in the center region of the hailstones was approximately five times greater than in the peripheral region.